

Applicant/Serial No.: Hisashi Kyotani / 10/763,435  
Filed/Conf. No. 01/23/2004 / Conf. No. 6826  
Examiner/Group: Brenda A. Lamb / 1734  
Amendment mailed: 10/26/2005  
Attorney File: MM0805US (#90326)

### **AMENDMENTS TO THE CLAIMS**

1. (currently amended) A conveyance method for a processing step, comprising:
  - while a movable body is ~~moving or while the movable body is stopped, the movable body being caused to move~~ travelling along a processing line including a processing liquid tank located at a prescribed position or while the movable body is stopped,
  - operating an operating arm supported on the movable body in a downward direction, and rotating a supporting body provided on a front end section of the operating arm about an axis in a lateral direction of the processing line, introducing a conveyance object supported on the supporting body into a processing liquid in the processing liquid tank thereby processing the conveyance object, and removing the conveyance object from the processing liquid;
  - rotating the supporting body in accordance with the shape of the conveyance object thereby controlling an angle of the conveyance object, upon introduction of the conveyance object into the processing liquid;
  - rotating the supporting body in accordance with the shape of the conveyance object thereby controlling the angle of the conveyance object, during immersion and processing of the conveyance object in the processing liquid; and
  - rotating the supporting body in accordance with the shape of the conveyance object thereby controlling the angle of the conveyance object, upon removal of the conveyance object from the processing liquid.

2. (original) The conveyance method for a processing step according to claim 1, further comprising:

operating the operating arm in the downward direction by means of a drive section of an arm operating device provided separately from the movable body; and

rotating the supporting body about an axis in the lateral direction of the processing line by means of a drive section of an angle adjusting device located separately from the movable body.

3. (currently amended) A conveyance apparatus for a processing step, comprising:

a plurality of movable bodies capable of travelling along a processing line;

a processing liquid tank located below the processing line[[:]];

a conveyance drive device for causing the movable bodies to travel;

an operating arm supported operably in a downward direction on the movable bodies;

a supporting body held on the front end section of the operating arm rotatably about a rotating shaft, and supporting a conveyance object;

an arm operating device for operating the operating arm downward, said arm operating device comprising a driven member connected to and moving downward the operating arm, and an operating member located along the processing line and guiding the driven member; and

an angle adjusting device capable of adjusting the angle of the conveyance object by rotating the supporting body,

wherein the operating arm is caused to operate downward by the arm operating device while the movable body is moved along the processing line by the conveyance drive device or while the movable body being moved along the processing line is stopped, the conveyance object

supported on the supporting body is immersed in the processing liquid in the processing liquid tank, and the supporting body is rotated by means of the angle adjusting device in accordance with the shape of the conveyance object, thereby controlling the angle of the conveyance object upon introduction into the processing liquid, the angle thereof during processing in the processing liquid, and the angle thereof upon removal from the processing liquid can be controlled respectively.

4. (canceled)

5. (currently amended) The conveyance apparatus for a processing step according to claim 3, wherein said angle adjusting device comprises a drive section and an angle adjusting passive section, and wherein the drive section of the angle adjusting device comprises:

an angle adjusting drive device capable of moving in synchronization with the movable body;

an angle adjusting shaft provided on the angle adjusting drive device; and

a coupling mechanism capable of coupling and decoupling the angle adjusting shaft to and from the angle adjusting passive section, and capable of rotating the supporting body.

6. (currently amended) The conveyance apparatus for a processing step according to claim 3, wherein the angle adjusting device comprises a drive section and an angle adjusting passive section, and wherein the drive section of the angle adjusting device comprises an angle adjusting drive device capable of moving in synchronization with the movable body, an angle adjusting shaft provided on the angle adjusting drive device, and a coupling mechanism capable of

coupling and decoupling the angle adjusting shaft to and from the angle adjusting passive section and capable of rotating the supporting body, wherein the angle adjusting passive section includes a transmission mechanism for operatively connecting a transmission shaft member provided coaxially on a supporting shaft supporting the operating arm and connected to the angle adjusting shaft, and the rotating shaft of the supporting body.

7. (currently amended) The conveyance apparatus for a processing step according to claim 3, wherein the angle adjusting device comprises a drive section and an angle adjusting passive section, and wherein the drive section of the angle adjusting device comprises an angle adjusting drive device capable of moving in synchronization with the movable body, an angle adjusting shaft provided on the angle adjusting drive device, and a coupling mechanism capable of coupling and decoupling the angle adjusting shaft to and from the angle adjusting passive section and capable of rotating the supporting body, wherein the angle adjusting drive device is located on a travelling carriage capable of travelling reciprocally in parallel to the processing line, the travelling carriage including a coupling mechanism coupled to the movable body and travelling in synchronization with the movable body.

8. (canceled)

9. (original) The conveyance apparatus for a processing step according to claim 3, wherein the arm operating device comprises a cam roller connected to and tilting downward the operating arm, and a cam rail located along the processing line and guiding the cam roller, wherein the cam rail is arranged in a plurality of number along the processing line and a

switching device is located respectively at an input section where the cam roller is introduced onto the cam rail and an output section where the cam roller is removed from the cam rail, wherein at least one of the cam rails comprises a non-operating cam rail for allowing the tilting arm to pass without moving downward.

10. (original) The conveyance apparatus for a processing step according to claim 3, further comprising a processing control device for controlling the angle adjusting device, the arm operating device, and the conveyance drive device for the movable body, on the basis of the shape of the conveyance object.

11. (currently amended) A conveyance apparatus for a processing step, comprising:

- a plurality of conveyance ~~carriage~~ carriages capable of travelling along a processing line;
- a processing liquid tank located below the processing line;
- a conveyance drive device for causing the conveyance carriage to travel;
- a tilting arm supported on the ~~movable body~~ respective conveyance carriages to be rotatable in a downward direction about a tilting shaft;
- a supporting body for supporting a conveyance object, the supporting body being held on the front end section of the tilting arm to be rotatable about a rotating shaft in a width direction of the coating line;
- an arm tilting device for moving the tilting arm in a downward direction, the arm tilting device comprising: ; and
- a cam roller located on an end portion of the tilting arm opposite to the supporting body; and

a cam rail located along the processing line in the vicinity of the processing liquid tank and guiding the cam roller,

wherein the cam rail is arranged in a plurality of numbers along the processing line, and a switching device is located at an input section where the cam roller is introduced onto the cam rail and at an output section where the cam roller is removed from the cam rail respectively, the switching device switching the cam rail to be introduced thereonto with the cam roller, and

wherein at least one of the cam rails comprises a non-operating cam rail for allowing the tilting arm to pass without moving downward; and  
an angle adjusting device capable of adjusting the angle of the conveyance object by rotating the supporting body,

wherein the tilting arm is operated downward by the arm tilting device while the conveyance carriage is being moved along the processing line by the conveyance drive device, the conveyance object supported on the supporting body is immersed in a processing liquid in the processing liquid tank, and the supporting body is rotated by means of the angle adjusting device in accordance with the shape of the conveyance object, thereby controlling the angle of the conveyance object upon introduction into the processing liquid, the angle thereof during processing in the processing liquid, and the angle thereof upon removal from the processing liquid can be controlled respectively.

12. (canceled)

13. (currently amended) The conveyance apparatus for a processing step according to claim 11, and further comprising an arm operating device wherein:

the arm operating device comprises an angle adjusting drive section located on a travelling carriage capable of travelling along the processing line in the vicinity of the processing liquid tank, and an angle adjusting passive section located on the conveyance carriage and moving the tilting arm in a downward direction, and

the drive section comprises an angle adjusting drive device capable of moving the travelling carriage in synchronization with the conveyance carriage, an angle adjusting shaft driven to rotate by the angle adjusting drive device, and a carriage coupling device capable of connecting and disconnecting the angle adjusting shaft to and from the angle adjusting passive section,

the travelling carriage including a coupling mechanism mounted thereon and connected to the conveyance carriage to travel in synchronization with the conveyance carriage.

14. (new) A conveyance apparatus for a processing step, comprising:

a plurality of movable bodies capable of travelling along a processing line;  
a processing liquid tank located below the processing line;  
a conveyance drive device for causing the movable bodies to travel;  
an operating arm supported operably in a downward direction on the movable bodies;  
a supporting body held on the front end section of the operating arm rotatably about a rotating shaft, and supporting a conveyance object;  
an arm operating device for operating the operating arm downward, the arm operating device comprising:

a driven member connected to and moving downward the operating arm;

an operating member located along the processing line and guiding the driven member;

a drive section separated from the movable body and located in the vicinity of the processing liquid tank; and

a passive section provided on the movable body and operating the operating arm downward by means of the drive section; and

an angle adjusting device capable of adjusting the angle of the conveyance object by rotating the supporting body,

wherein the operating arm is caused to operate downward by the arm operating device while the movable body is moved along the processing line by the conveyance drive device or while the movable body being moved along the processing line is stopped, the conveyance object supported on the supporting body is immersed in the processing liquid in the processing liquid tank, and the supporting body is rotated by means of the angle adjusting device in accordance with the shape of the conveyance object, thereby controlling the angle of the conveyance object upon introduction into the processing liquid, the angle thereof during processing in the processing liquid, and the angle thereof upon removal from the processing liquid can be controlled respectively.

\* \* \*